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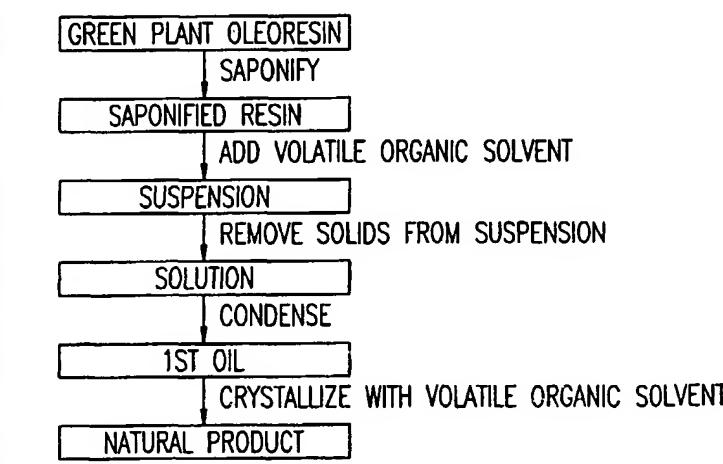
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(54) Title: ISOLATION OF LUTEIN FROM ALFALFA



(57) Abstract: The present invention provides a process for an industrial scale extraction and purification of xanthophylls (e.g., lutein and zeaxanthin) from plant material (e.g., alfalfa or other leafy green crops having high levels of chlorophyll). The process involves harvesting lutein rich alfalfa, extracting an oleoresin from the alfalfa leaves, saponifying the oleoresin, extracting and extracting lutein using a series of solvent extractions specific for oleoresin obtained from alfalfa or other leafy green plants.

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INTERNATIONAL SEARCH REPORT

International Application No
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A. CLASSIFICATION OF SUBJECT MATTER					
IPC 7	C07C403/08	A23K1/16	A23L1/03	A61K7/00	A61K31/07
	A61P1/04	A61P35/00	A61P9/00	A61P27/02	

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C07C A23K A23L A61K A61P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EP0-Internal, BEILSTEIN Data, WPI Data, PAJ, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 382 714 A (F. KHACHIK) 17 January 1995 (1995-01-17)	1-14, 17-71, 95,96,98
Y	claim 5; examples 1,2; table I -----	15,16
A	US 6 329 557 B1 (G. RODRIGUEZ, ET AL.) 11 December 2001 (2001-12-11)	1-71,95, 96,98
Y	column 4, line 9 - line 20; claim 12 -----	15,16
Y	US 6 504 067 B1 (R. MONTOYA-OLVERA, ET AL.) 7 January 2003 (2003-01-07) column 1, line 43 - line 52 -----	15,16
Y	US 6 376 722 B1 (V.E. RIDAURA SANZ, ET AL.) 23 April 2002 (2002-04-23) column 6, line 66 - column 7, line 5; claims 1,3 ----- -/-	15,16

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the International search

Date of mailing of the international search report

31 August 2004

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INTERNATIONAL SEARCH REPORTInternational Application No
PCT/US2004/006721**C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 1 044 954 A (INDUSTRIAL ORGANICA) 18 October 2000 (2000-10-18) claims 1-5 -----	15,16

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2004/006721

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-72, 95, 96, 98

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-72, 95, 96, 98

Natural product and a method for obtaining it

2. claims: 73-76 (in part), 86, 97 (in part)

Use of a natural product in the treatment of an ulcer

3. claims: 73-76 (in part), 87, 97 (in part)

Use of a natural product in the treatment of cancer

4. claims: 73-76 (in part), 88, 97 (in part)

Use of a natural product in the treatment of heart disease

5. claims: 73-76 (in part), 89, 97 (in part)

Use of a natural product in the treatment of macular degeneration

6. claims: 77-80

Neutraceutical formulation comprising a natural product

7. claims: 81-85

Cosmetic composition comprising a natural product

8. claims: 90-94

Dietary supplement comprising a natural product

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US2004/006721

Patent document cited in search report	Publication date	Patent family member(s)			Publication date
US 5382714	A 17-01-1995	AT 191475 T DE 69516031 D1 DE 69516031 T2 DK 672655 T3 EP 0672655 A1 ES 2147261 T3 JP 2790212 B2 JP 8092205 A KR 214430 B1 PT 672655 T			15-04-2000 11-05-2000 14-09-2000 03-07-2000 20-09-1995 01-09-2000 27-08-1998 09-04-1996 02-08-1999 29-09-2000
US 6329557	B1 11-12-2001	AU 6627701 A CN 1434792 T EP 1289916 A2 WO 0194279 A2 JP 2003535835 T NO 20025785 A			17-12-2001 06-08-2003 12-03-2003 13-12-2001 02-12-2003 02-12-2002
US 6504067	B1 07-01-2003	WO 0128966 A2			26-04-2001
US 6376722	B1 23-04-2002	AU 1055799 A EP 1030837 A1 WO 9923067 A1			24-05-1999 30-08-2000 14-05-1999
EP 1044954	A 18-10-2000	US 5959138 A AU 1445899 A BR 9814670 A CA 2311394 A1 DE 69813626 D1 DE 69813626 T2 EP 1044954 A1 JP 2001524463 T NO 20002648 A CN 1278786 T ES 2197518 T3 WO 9926914 A1 PT 1044954 T			28-09-1999 15-06-1999 03-10-2000 03-06-1999 22-05-2003 05-02-2004 18-10-2000 04-12-2001 24-07-2000 03-01-2001 01-01-2004 03-06-1999 29-08-2003

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